

JUDITH GAP

WHEATLAND COUNTY

The Judith Gap site is located about 6 miles south of the town of Judith Gap at 46 36 57 N and 109 46 11 W (Site No. 134 on Map II-1). Elevation at the site is about 4,600 feet. The site was established by the Bureau of Reclamation as part of its Northern Great Plains Wind Energy Study.

The site sits on a gently sloping plain to the south of Judith Gap. The Musselshell River flows to the south. To the northwest are the Little Belt Mountains, with summits to about 7,000 feet. The Snowy Mountains, with summits to about 8,600 feet, rise to the northeast. Between these ranges is the Judith Gap. To the southwest, the Crazy Mountains rise to over 11,000 feet.

Most of the land in the area is privately owned and used for agriculture, although a few scattered sections are owned by the state. Land in the mountains is controlled by the U.S. Forest Service.

Electrical power in the area is provided by the Montana Power Company and the Fergus Electric Cooperative. A 230-kV power transmission line runs near the site and many smaller transmission lines cross the area. The nearest commercial airport is at Lewistown. The area is in the aircraft corridors from Billings to Helena and Billings to Great Falls.

Collection of wind data at the site began on August 1, 1981. The site was closed in 1985; data are available through July 31. The data set consists of hourly averages of wind speed, wind direction, temperature, pressure, and relative humidity. Data were collected by an automatic system that transmitted information by satellite to Denver for further processing. Anemometer height was 7 meters. (It is erroneously listed in several publications as being at a height of 10 meters.)

Overall data recovery at the site was excellent; however, due to technical problems, the Bureau of Reclamation was unable to provide DNRC with copies of the data from six months. The resulting data recovery rates ranged from 47.5 percent in January to 97.9 percent in February. Overall data recovery was 81.9 percent. Data from this site should adequately represent the area in the Judith Gap.

Average annual wind speed at the site was 13.0 miles per hour. Average monthly wind speeds varied from 10.7 miles per hour in August to 15.6 miles per hour in January.

Average annual wind power was 239.2 watts/m². Average monthly wind power ranged from 127.4 watts/m² in August to 471.7 watts/m² in January.

Average seasonal wind speeds were 11.3 miles per hour in summer, 12.4 miles per hour in autumn, 13.5 miles per hour in spring, and 14.9 miles per hour in winter. During the summer, the highest average wind speeds occurred in late afternoon. In all other seasons, the highest average wind speeds occurred in early afternoon. The lowest average wind speeds generally occurred between 2200 MST and 0500 MST in the winter, 0300 MST in the spring, 0800 MST in the summer, and 0600 MST in the autumn. The diurnal range of average wind speeds was least in winter.

The most common wind directions were north-northwest through north and west-southwest through west-northwest. Winds from the northeast through east were least common. By direction, average speeds ranged from 5.0 miles per hour for winds from the east-northeast to 17.8 miles per hour for winds from the west.

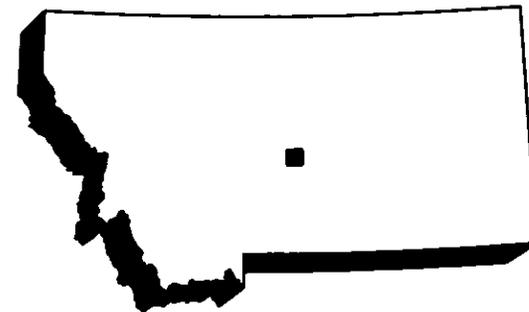


Table IV - 160

Monthly Wind Speed Distribution

WHEATLAND COUNTY - JUDITH GAP

08/06/81 - 07/31/85

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR	
CALM	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	CALM
0.1-1.0	0.6	0.6	1.7	0.8	0.6	0.9	0.7	0.8	0.4	1.1	1.5	0.8	0.9	0.1- 0.4
1.1-2.0	1.8	1.9	2.4	2.2	2.1	2.2	2.5	1.8	2.4	2.8	2.7	2.7	2.3	0.5- 0.9
S 2.1-3.0	3.1	2.4	3.4	3.1	2.5	4.0	3.0	2.6	1.9	3.1	4.1	3.1	3.0	1.0- 1.3
P 3.1-4.0	4.5	4.0	5.2	5.5	4.1	5.9	6.0	7.1	5.3	6.0	6.1	5.3	5.4	1.4- 1.8
E 4.1-5.0	4.2	3.8	4.1	4.9	4.0	5.6	5.7	5.4	4.6	4.4	4.4	4.8	4.7	1.9- 2.2
E 5.1-6.0	5.9	4.6	6.2	6.0	6.1	6.7	6.9	8.3	6.0	7.1	6.3	5.8	6.3	2.3- 2.7
D 6.1-7.0	4.9	3.8	4.2	5.2	5.8	5.6	6.0	7.0	5.8	5.5	5.0	3.9	5.2	2.8- 3.1
7.1-8.0	5.7	4.7	4.5	6.2	5.2	6.1	7.2	7.7	6.5	6.2	4.4	3.8	5.7	3.2- 3.6
M 8.1-9.0	5.4	4.4	5.4	4.9	5.4	4.8	6.3	7.2	5.8	5.8	4.2	3.1	5.2	3.7- 4.0
I 9.1-10.0	5.2	5.0	5.6	5.6	6.5	7.6	7.3	9.5	8.9	7.0	4.7	4.7	6.5	4.1- 4.5
L 10.1-11.0	3.7	4.2	3.9	4.0	4.4	5.8	4.8	5.6	5.9	4.0	4.7	3.0	4.6	4.6- 4.9
E 11.1-12.0	4.9	5.2	5.0	5.4	5.9	5.0	5.5	6.5	6.8	5.1	5.0	4.9	5.5	5.0- 5.4
S 12.1-13.0	3.0	3.2	3.9	3.2	3.5	3.4	4.0	3.7	3.7	2.6	4.2	4.2	3.6	5.5- 5.8
/ 13.1-14.0	2.7	4.0	4.1	3.9	4.0	4.0	3.9	4.2	3.6	3.2	5.4	4.0	4.0	5.9- 6.3
H 14.1-15.0	2.0	3.1	3.4	2.7	3.5	3.6	3.2	2.6	2.7	2.8	4.7	3.9	3.2	6.4- 6.7
O 15.1-16.0	2.0	2.8	2.5	2.3	2.3	2.9	2.5	1.9	2.2	2.4	2.9	3.3	2.5	6.8- 7.2
U 16.1-17.0	2.5	4.5	3.5	2.8	3.0	4.0	3.7	3.5	3.3	3.7	4.2	3.5	3.6	7.3- 7.6
R 17.1-18.0	2.0	3.0	2.7	2.8	2.6	2.4	3.0	1.6	2.5	1.6	2.8	3.1	2.6	7.7- 8.0
18.1-19.0	2.0	3.7	3.1	3.2	3.2	3.0	2.5	1.6	2.8	2.3	3.4	3.5	2.9	8.1- 8.5
19.1-20.0	2.3	3.1	2.3	2.4	2.2	1.8	2.9	1.7	3.3	2.2	3.1	2.9	2.5	8.6- 8.9
20.1-25.0	10.0	13.5	13.2	9.5	10.8	8.7	7.7	5.3	9.3	9.8	10.2	12.3	10.1	9.0-11.2
25.1-30.0	9.5	8.9	6.9	6.5	7.8	4.6	3.0	2.7	4.4	7.1	4.5	8.1	6.0	11.3-13.4
30.1-35.0	5.9	3.4	2.0	4.2	3.5	1.0	1.2	1.4	1.2	3.3	1.2	4.3	2.6	13.5-15.6
35.1-40.0	3.6	1.4	0.7	1.7	0.6	0.1	0.2	0.3	0.3	0.8	0.1	0.7	0.8	15.7-17.9
>40.0	2.4	0.8	0.1	0.9	0.1	0.0	0.3	0.0	0.3	0.0	0.0	0.4	0.4	>17.9
AVERAGE														
SPEED (MPH)	15.6	15.0	13.3	13.7	13.7	11.7	11.5	10.7	12.2	12.8	12.3	14.3	13.0	
AVERAGE														
SPEED (M/SEC)	7.0	6.7	5.9	6.1	6.1	5.2	5.1	4.8	5.5	5.7	5.5	6.4	5.8	
AVERAGE														
WIND POWER														
(WATTS/M**2)	471.7	337.4	245.9	302.0	256.4	160.2	153.2	127.4	181.4	237.3	184.3	307.4	239.2	
PERCENT DATA														
RECOVERY	47.5	97.9	97.0	96.2	73.0	93.2	97.8	70.8	94.6	71.1	73.5	72.3	81.9	

ANEMOMETER HEIGHT = 7 METERS = 22.5 FEET
 NUMBER OF OBSERVATIONS = 28626
 PERCENTAGE DATA RECOVERY = 81.9

SOURCE: GEORESEARCH, INC.

Table IV - 161

Percentage Frequency Summary for Wind Speed

WHEATLAND COUNTY - JUDITH GAP (WINTER)

08/06/81 - 07/31/85

		WIND SPEED (MPH)																	
CALM		0.1-2.0	2.1-4.0	4.1-6.0	6.1-8.0	8.1-10.0	10.1-12.0	12.1-14.0	14.1-16.0	16.1-18.0	18.1-20.0	20.1-25.0	25.1-30.0	30.1-35.0	35.1-40.0	>40.0	AV SPEED (MPH)	AV SPEED (M/SEC)	
CALM		0.1-0.9	0.9-1.8	1.8-2.7	2.7-3.6	3.6-4.5	4.5-5.4	5.4-6.3	6.3-7.2	7.2-8.0	8.1-8.9	9.0-11.2	11.2-13.4	13.5-15.6	15.7-17.9	>17.9			
	1	0.0	4.5	8.3	9.4	11.7	9.4	10.2	7.5	6.0	5.6	4.1	12.8	4.5	4.5	1.1	0.4	13.5	6.1
	2	0.0	4.1	5.6	13.2	9.0	9.8	12.4	6.0	6.8	6.4	6.0	11.3	4.5	3.0	1.5	0.4	13.4	6.0
	3	0.0	4.9	7.9	12.8	8.7	10.9	8.3	9.1	5.3	4.2	6.8	10.9	4.2	4.9	0.4	0.8	13.2	5.9
	4	0.0	3.8	8.7	10.6	7.2	11.7	11.7	7.2	6.4	8.3	4.5	7.9	6.8	4.5	0.4	0.4	13.3	6.0
	5	0.0	3.0	9.5	7.2	9.1	15.2	9.9	8.7	3.8	5.7	6.5	9.9	4.2	4.2	2.3	0.8	13.8	6.2
	6	0.0	3.8	7.3	10.0	7.3	10.0	11.5	8.0	7.7	6.9	6.9	10.3	4.2	3.8	1.1	1.1	14.0	6.3
	7	0.0	3.4	8.8	12.3	7.7	8.8	8.0	11.1	6.9	6.9	5.0	10.0	6.1	3.1	1.5	0.4	13.6	6.1
	8	0.0	1.9	9.6	8.0	10.0	8.4	9.2	8.8	8.4	6.9	4.2	13.4	6.5	2.3	1.1	1.1	14.1	6.3
H	9	0.0	1.5	8.8	11.1	10.0	7.3	6.5	6.9	8.0	8.4	5.0	14.9	5.7	2.3	2.3	1.1	14.6	6.5
O	10	0.0	3.8	11.2	9.2	8.1	5.8	5.8	10.0	5.8	5.0	5.8	17.3	5.0	5.0	1.5	0.8	14.7	6.6
	11	0.0	3.2	6.0	12.4	6.8	6.8	6.4	6.4	7.6	7.6	8.8	13.9	6.4	4.4	2.8	0.8	15.5	6.9
U	12	0.0	2.7	5.8	7.6	9.8	6.3	5.4	4.0	3.1	8.9	6.7	23.2	7.6	5.8	1.8	1.3	16.9	7.6
	13	0.0	1.5	4.1	8.6	7.9	10.1	7.5	4.5	3.0	5.2	5.6	21.3	9.4	8.6	1.5	1.1	17.4	7.8
R	14	0.0	0.4	7.1	5.2	7.9	4.5	8.2	6.0	2.6	4.5	8.6	21.3	12.0	8.2	1.9	1.5	18.3	8.2
	15	0.0	1.5	3.7	7.1	6.7	6.4	7.1	4.5	4.5	6.7	6.7	20.6	14.2	7.1	1.1	1.9	18.2	8.1
	16	0.0	1.1	6.8	3.0	6.0	9.4	6.8	6.8	6.0	6.0	9.8	18.9	8.7	7.9	1.9	0.8	17.5	7.8
	17	0.0	1.1	5.3	7.6	7.6	9.5	9.2	5.7	5.7	7.3	7.3	17.6	8.0	5.3	2.3	0.4	16.3	7.3
	18	0.0	0.8	5.7	8.4	10.3	11.1	10.3	6.9	5.7	6.1	6.5	14.5	7.3	5.3	0.4	0.8	15.0	6.7
	19	0.4	1.9	5.8	10.8	9.6	11.5	10.4	5.4	4.6	8.8	6.9	12.7	7.7	2.7	0.4	0.4	14.1	6.3
	20	0.0	3.5	6.9	10.4	9.3	10.4	8.1	6.2	5.8	8.1	6.2	15.4	3.9	4.6	0.0	1.2	14.1	6.3
	21	0.0	3.5	7.7	12.7	5.8	9.3	10.8	9.3	6.2	5.8	3.9	12.7	6.9	4.2	0.8	0.4	14.0	6.2
	22	0.0	3.9	10.1	8.9	10.1	10.1	8.9	7.8	7.4	5.4	4.7	8.9	7.4	5.4	1.2	0.0	13.7	6.1
	23	0.0	3.1	9.4	10.2	11.4	8.2	9.0	8.2	7.5	5.5	4.3	12.2	4.3	5.5	0.8	0.4	13.7	6.1
	24	0.0	4.6	6.3	13.5	11.4	8.0	8.0	8.4	5.9	6.8	5.1	9.3	7.6	3.8	0.8	0.4	13.5	6.0
ALL HOURS		0.0	2.8	7.4	9.6	8.7	9.1	8.8	7.2	5.9	6.5	6.1	14.2	6.8	4.9	1.3	0.8	14.9	6.6

SOURCE: GEORESEARCH, INC.

Table IV - 162

Percentage Frequency Summary for Wind Speed

WHEATLAND COUNTY - JUDITH GAP (SPRING)

08/06/81 - 07/31/85

		WIND SPEED (MPH)																	
CALM		0.1- 2.0	2.1- 4.0	4.1- 6.0	6.1- 8.0	8.1- 10.0	10.1- 12.0	12.1- 14.0	14.1- 16.0	16.1- 18.0	18.1- 20.0	20.1- 25.0	25.1- 30.0	30.1- 35.0	35.1- 40.0	>40.0	AV SPEED (MPH)	AV SPEED (M/SEC)	
		WIND SPEED (METERS/SECOND)																	
CALM		0.1- 0.9	0.9- 1.8	1.8- 2.7	2.7- 3.6	3.6- 4.5	4.5- 5.4	5.4- 6.3	6.3- 7.2	7.2- 8.0	8.1- 8.9	9.0- 11.2	11.2- 13.4	13.5- 15.6	15.7- 17.9	>17.9	AV SPEED (MPH)	AV SPEED (M/SEC)	
	1	0.0	6.2	11.0	15.4	13.4	11.3	8.3	8.6	5.0	3.6	2.7	8.0	3.0	3.0	0.6	0.0	11.0	4.9
	2	0.0	6.2	12.8	14.5	11.9	10.7	9.8	8.6	2.4	5.6	4.5	5.9	4.5	1.8	0.9	0.0	11.0	4.9
	3	0.0	5.6	11.0	13.4	13.4	13.4	8.9	8.3	4.5	4.5	3.9	7.1	2.7	3.6	0.0	0.0	11.1	4.9
	4	0.0	3.6	7.7	15.2	12.8	12.2	11.6	8.3	5.1	5.4	4.2	6.3	4.2	3.3	0.3	0.0	11.7	5.2
	5	0.0	4.2	12.2	11.9	11.0	11.9	11.3	8.0	6.5	5.4	2.1	6.8	4.8	3.6	0.3	0.0	11.7	5.2
	6	0.0	4.8	12.5	14.0	11.0	10.1	8.1	7.8	6.0	5.4	5.1	9.0	2.7	3.0	0.6	0.0	11.6	5.2
	7	0.0	4.8	15.3	12.0	8.7	9.3	8.1	3.9	6.9	6.0	5.7	11.1	2.1	4.2	1.5	0.6	12.4	5.5
	8	0.3	4.5	12.4	11.2	10.3	6.9	5.4	3.9	5.7	6.6	6.3	16.0	3.6	4.5	1.5	0.6	13.6	6.1
H	9	0.0	2.1	8.5	12.7	8.2	9.1	5.8	4.5	5.2	7.3	9.1	15.8	4.5	4.5	2.1	0.6	14.8	6.6
	10	0.0	2.1	3.4	9.8	10.1	8.9	10.7	6.1	5.8	5.8	4.9	19.0	7.0	4.0	1.8	0.6	15.6	7.0
O	11	0.0	2.9	4.5	6.8	7.7	10.9	8.4	6.8	4.8	6.8	4.5	19.3	9.6	5.8	1.0	0.3	16.1	7.2
	12	0.0	0.4	4.1	9.5	7.9	9.1	9.1	6.6	5.0	7.4	5.8	18.6	7.9	6.6	1.2	0.8	16.5	7.4
U	13	0.0	1.2	4.2	7.4	5.9	11.0	7.1	8.9	4.5	6.5	7.4	18.7	9.2	6.5	0.6	0.9	16.7	7.5
	14	0.0	0.6	3.3	8.0	6.0	8.9	10.4	7.7	5.4	6.5	5.4	19.9	10.1	6.5	0.9	0.3	16.8	7.5
R	15	0.0	2.1	1.8	4.8	7.8	13.1	5.4	7.2	7.8	5.7	8.1	21.5	7.8	5.7	0.6	0.9	16.8	7.5
	16	0.0	0.6	3.3	5.1	10.4	9.9	6.9	8.1	5.7	7.8	6.3	22.1	8.7	4.5	0.6	0.3	16.5	7.4
	17	0.0	2.1	3.6	4.5	9.3	8.4	7.8	9.6	5.4	8.7	10.2	18.3	7.8	3.6	0.9	0.0	16.0	7.2
	18	0.0	0.9	5.4	7.5	6.9	9.3	11.7	8.7	10.2	5.7	6.6	16.2	8.1	2.4	0.6	0.0	15.0	6.7
	19	0.0	3.0	4.5	10.2	11.1	12.6	9.6	9.3	6.9	6.9	6.3	14.1	3.3	0.9	0.9	0.3	13.3	5.9
	20	0.3	2.4	4.8	11.1	15.4	13.0	13.6	9.3	6.0	5.7	4.2	8.4	3.9	1.2	0.3	0.3	12.1	5.4
	21	0.0	2.4	8.2	9.7	12.8	17.9	13.4	8.2	4.6	4.9	4.9	8.5	3.0	1.2	0.3	0.0	11.6	5.2
	22	0.0	5.5	10.4	11.9	12.5	14.6	13.4	6.4	4.9	3.0	4.9	7.9	3.7	0.6	0.3	0.0	10.9	4.9
	23	0.0	4.7	14.7	11.3	9.1	13.8	11.6	8.4	5.0	4.4	4.4	6.6	2.8	2.8	0.6	0.0	11.2	5.0
	24	0.0	4.6	13.7	12.3	12.6	9.8	11.9	9.1	4.2	4.6	4.2	4.9	4.2	3.5	0.0	0.4	11.2	5.0
ALL HOURS		0.0	3.3	8.1	10.4	10.3	11.1	9.5	7.6	5.6	5.8	5.5	12.9	5.4	3.6	0.8	0.3	13.5	6.0

SOURCE: GEORESEARCH, INC.

Table IV - 163

Percentage Frequency Summary for Wind Speed

WHEATLAND COUNTY - JUDITH GAP (SUMMER)

08/06/81 - 07/31/85

		WIND SPEED (MPH)																AV	AV
CALM		0.1- 2.0	2.1- 4.0	4.1- 6.0	6.1- 8.0	8.1- 10.0	10.1- 12.0	12.1- 14.0	14.1- 16.0	16.1- 18.0	18.1- 20.0	20.1- 25.0	25.1- 30.0	30.1- 35.0	35.1- 40.0	>40.0			
		WIND SPEED (METERS/SECOND)																AV	AV
CALM		0.1- 0.9	0.9- 1.8	1.8- 2.7	2.7- 3.6	3.6- 4.5	4.5- 5.4	5.4- 6.3	6.3- 7.2	7.2- 8.0	8.1- 8.9	9.0- 11.2	11.2- 13.4	13.5- 15.6	15.7- 17.9	>17.9	SPEED (MPH)	SPEED (M/SEC)	
	1	0.0	5.6	11.1	18.8	15.4	14.2	10.8	6.5	4.0	3.4	2.5	4.6	2.5	0.6	0.0	9.4	4.2	
	2	0.0	6.5	14.2	16.4	17.9	14.5	8.0	6.2	2.5	3.7	2.5	5.2	2.5	0.0	0.0	9.0	4.0	
	3	0.3	5.6	15.2	16.4	16.1	16.7	6.2	5.6	3.7	5.0	2.5	5.6	0.6	0.6	0.0	9.0	4.0	
	4	0.0	5.3	16.1	17.1	15.5	15.2	9.0	6.8	3.4	2.8	1.9	5.3	0.9	0.6	0.0	8.9	4.0	
	5	0.0	6.5	16.1	19.6	16.1	13.0	7.5	6.5	1.9	3.7	3.1	3.7	1.6	0.3	0.3	8.6	3.9	
	6	0.0	4.0	15.9	19.0	17.8	13.1	7.2	6.2	3.4	3.4	2.8	4.7	1.9	0.3	0.3	9.0	4.0	
	7	0.0	5.3	16.3	20.9	12.5	11.3	7.2	5.0	4.1	4.4	3.8	6.9	0.6	1.3	0.6	9.5	4.2	
	8	0.0	5.0	15.4	19.5	11.9	8.8	7.2	6.0	5.3	3.1	5.3	8.5	2.8	0.9	0.0	10.2	4.6	
H	9	0.0	1.6	13.6	15.1	15.1	8.8	8.8	6.3	6.0	5.7	5.4	8.2	3.5	1.9	0.0	11.3	5.0	
	10	0.0	1.9	9.2	12.3	14.2	13.0	6.6	6.3	6.3	8.2	4.1	11.4	4.1	2.2	0.0	12.3	5.5	
O	11	0.0	1.3	5.8	11.2	13.5	15.4	8.0	6.4	5.4	7.1	7.4	12.2	4.2	2.2	0.0	13.0	5.8	
	12	0.0	2.0	4.7	9.5	8.4	17.9	12.2	6.4	4.4	7.4	11.1	9.5	3.4	3.0	0.0	13.3	5.9	
U	13	0.0	1.9	5.3	6.2	9.3	13.0	12.7	10.8	8.4	9.0	5.3	11.5	3.4	2.5	0.6	13.7	6.1	
	14	0.0	0.9	4.0	6.5	9.6	13.3	12.7	9.3	9.6	8.0	5.9	13.0	4.0	2.8	0.0	14.1	6.3	
R	15	0.0	0.9	3.1	7.1	9.9	11.5	14.9	8.4	9.0	9.0	6.8	13.6	2.5	2.8	0.3	14.2	6.3	
	16	0.0	0.3	3.7	4.3	9.0	12.4	14.2	12.4	6.5	9.3	7.4	14.9	3.4	1.5	0.3	14.4	6.4	
	17	0.0	0.3	1.9	6.9	8.2	12.9	14.7	10.0	8.8	9.7	6.3	13.8	6.3	0.3	0.0	14.3	6.4	
	18	0.0	0.9	4.1	6.6	8.8	11.6	16.0	8.5	9.7	10.7	6.9	10.3	5.0	0.6	0.0	13.7	6.1	
	19	0.0	2.2	3.4	9.1	7.8	13.8	15.4	11.3	7.2	10.0	6.9	9.4	2.8	0.6	0.0	12.8	5.7	
	20	0.0	3.1	7.9	8.2	12.9	15.4	16.7	10.4	6.9	7.9	2.5	5.7	1.3	1.3	0.0	11.1	5.0	
	21	0.0	2.8	7.3	14.6	13.9	21.2	10.8	9.5	4.1	5.1	2.8	4.4	2.2	1.3	0.0	10.5	4.7	
	22	0.0	2.9	10.2	12.4	15.3	20.1	12.4	7.6	4.1	4.5	1.6	6.7	0.6	1.3	0.0	10.2	4.6	
	23	0.0	3.5	10.0	14.5	18.4	14.5	13.2	6.8	5.2	3.9	2.3	5.2	1.3	1.0	0.0	10.1	4.5	
	24	0.0	2.0	13.3	14.3	16.7	15.3	11.6	4.8	6.1	4.1	4.1	5.1	1.4	1.0	0.3	10.1	4.5	
ALL HOURS		0.0	3.0	9.5	12.8	13.1	14.0	11.0	7.7	5.7	6.2	4.6	8.3	2.6	1.3	0.1	11.3	5.1	

SOURCE: GEORESEARCH, INC.

Table IV - 164

Percentage Frequency Summary for Wind Speed

WHEATLAND COUNTY - JUDITH GAP (AUTUMN)

08/06/81 - 07/31/85

		WIND SPEED (MPH)																	
CALM		0.1- 2.0	2.1- 4.0	4.1- 6.0	6.1- 8.0	8.1- 10.0	10.1- 12.0	12.1- 14.0	14.1- 16.0	16.1- 18.0	18.1- 20.0	20.1- 25.0	25.1- 30.0	30.1- 35.0	35.1- 40.0	>40.0			
		WIND SPEED (METERS/SECOND)																AV	AV
CALM		0.1- 0.9	0.9- 1.8	1.8- 2.7	2.7- 3.6	3.6- 4.5	4.5- 5.4	5.4- 6.3	6.3- 7.2	7.2- 8.0	8.1- 8.9	9.0- 11.2	11.2- 13.4	13.5- 15.6	15.7- 17.9	>17.9	SPEED (MPH)	SPEED (M/SEC)	
	1	0.0	4.7	13.7	12.0	14.0	16.0	10.0	8.0	3.3	4.7	2.7	7.0	1.3	2.3	0.3	0.0	10.4	4.7
	2	0.0	5.0	12.3	17.3	14.3	11.7	11.0	5.3	4.3	3.7	4.7	6.3	1.7	2.0	0.3	0.0	10.2	4.6
	3	0.0	3.7	11.3	15.0	16.0	12.0	13.0	5.7	6.0	3.3	4.0	5.0	3.7	0.7	0.3	0.3	10.5	4.7
	4	0.0	2.3	12.7	13.0	17.3	14.7	9.3	8.3	4.7	4.0	4.3	5.0	2.3	2.0	0.0	0.0	10.5	4.7
	5	0.0	4.7	9.0	11.0	18.4	14.7	13.0	6.4	4.7	5.7	3.7	4.7	2.7	1.3	0.0	0.0	10.5	4.7
	6	0.0	6.0	9.7	13.1	15.4	13.8	12.4	6.7	5.0	3.4	3.0	6.7	2.3	2.0	0.0	0.3	10.5	4.7
	7	0.0	3.7	13.1	11.4	14.1	14.1	9.4	6.0	5.4	5.7	4.0	8.7	3.4	0.7	0.0	0.3	11.0	4.9
	8	0.0	4.7	11.1	14.1	10.7	11.7	7.4	8.1	5.7	5.7	5.7	11.7	1.3	1.7	0.0	0.3	11.5	5.2
H	9	0.0	4.4	12.8	11.1	10.1	9.7	7.7	7.4	6.7	6.7	6.7	10.7	3.7	2.0	0.0	0.3	12.2	5.4
	10	0.0	3.7	8.5	12.6	10.2	9.5	5.8	7.1	6.5	7.5	6.1	13.6	7.5	1.0	0.3	0.0	13.3	5.9
O	11	0.0	2.5	5.8	14.2	6.3	8.8	7.1	9.6	6.3	6.7	5.8	16.7	7.9	2.1	0.4	0.0	14.3	6.4
	12	0.0	2.0	5.5	9.5	9.5	7.0	8.5	5.0	3.5	8.5	6.0	22.5	6.5	5.5	0.5	0.0	15.7	7.0
U	13	0.0	1.7	7.3	5.7	7.7	8.0	7.3	5.3	7.0	8.0	10.0	18.7	8.3	4.3	0.7	0.0	16.0	7.1
	14	0.0	1.3	4.3	7.0	8.0	8.7	8.0	8.0	6.3	8.0	6.3	21.3	6.7	5.0	1.0	0.0	16.1	7.2
R	15	0.0	0.3	3.7	7.4	7.4	10.0	9.0	7.4	7.4	7.7	7.4	22.7	6.4	3.0	0.3	0.0	15.9	7.1
	16	0.0	0.3	4.0	8.4	5.7	10.7	10.1	6.7	8.1	9.1	8.1	18.8	6.0	3.7	0.3	0.0	15.6	7.0
	17	0.0	2.0	4.7	6.4	10.1	9.4	7.7	10.7	7.4	7.0	10.4	17.4	4.0	2.0	0.7	0.0	14.7	6.6
	18	0.0	2.7	4.4	8.7	6.4	12.8	12.4	9.1	7.4	9.7	7.7	13.8	3.4	1.7	0.0	0.0	13.6	6.1
	19	0.0	4.0	4.4	10.1	8.7	13.1	15.4	11.7	8.4	6.0	6.7	7.7	2.7	1.0	0.0	0.0	12.1	5.4
	20	0.0	3.7	6.1	8.5	12.2	20.1	14.3	6.8	6.8	6.1	6.1	6.5	2.0	0.7	0.0	0.0	11.4	5.1
	21	0.0	2.4	11.6	10.6	10.6	13.0	18.1	9.2	5.5	4.4	5.8	6.1	1.7	0.7	0.3	0.0	11.0	4.9
	22	0.0	5.5	8.9	13.4	11.6	14.7	17.1	5.1	4.5	5.1	2.7	7.2	2.4	1.0	0.7	0.0	10.7	4.8
	23	0.0	7.6	11.8	11.4	11.1	13.8	11.8	9.3	4.2	4.8	5.2	4.2	3.5	1.0	0.0	0.3	10.5	4.7
	24	0.4	7.0	11.0	10.3	13.2	17.2	9.5	7.3	3.7	4.4	3.7	8.1	1.8	2.2	0.4	0.0	10.7	4.8
	ALL HOURS	0.0	3.6	8.7	10.9	11.3	12.4	10.7	7.5	5.8	6.1	5.7	11.1	3.8	2.0	0.3	0.1	12.4	5.5

SOURCE: GEORESEARCH, INC.

Table IV - 165

Annual Wind Rose Distribution
WHEATLAND COUNTY - JUDITH GAP

08/06/81 - 07/31/85

DIRECTION>	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL	<DIRECTION	
SPEED (MPH)																	SPEED (M/SEC)		
0.1- 1.0	0.1	0.0	0.0	0.0	0.1	0.0	0.1	0.1	0.1	0.2	0.1	0.0	0.0	0.0	0.0	0.1	0.9	0.1- 0.4	
1.1- 2.0	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	2.3	0.5- 0.9	
2.1- 3.0	0.2	0.2	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	3.0	1.0- 1.3 S	
3.1- 4.0	0.3	0.2	0.2	0.2	0.2	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.3	0.4	0.4	0.5	0.4	5.4	1.4- 1.8 P
S 4.1- 5.0	0.3	0.2	0.1	0.1	0.1	0.2	0.5	0.4	0.3	0.4	0.3	0.3	0.3	0.4	0.5	0.3	4.7	1.9- 2.2 E	
P 5.1- 6.0	0.4	0.2	0.1	0.1	0.1	0.2	0.5	0.6	0.4	0.4	0.4	0.4	0.5	0.6	0.8	0.5	6.3	2.3- 2.7 E	
E 6.1- 7.0	0.3	0.2	0.1	0.0	0.1	0.2	0.4	0.5	0.3	0.3	0.2	0.3	0.4	0.6	0.7	0.5	5.2	2.8- 3.1 D	
E 7.1- 8.0	0.5	0.2	0.1	0.0	0.1	0.2	0.5	0.5	0.3	0.2	0.2	0.3	0.5	0.7	0.7	0.6	5.7	3.2- 3.6	
D 8.1- 9.0	0.5	0.2	0.0	0.0	0.0	0.2	0.4	0.5	0.2	0.1	0.2	0.3	0.5	0.7	0.8	0.5	5.2	3.7- 4.0 M	
9.1-10.0	0.8	0.3	0.0	0.0	0.0	0.3	0.5	0.6	0.3	0.1	0.2	0.4	0.6	0.9	0.8	0.7	6.5	4.1- 4.5 E	
M 10.1-11.0	0.6	0.2	0.0	0.0	0.0	0.1	0.4	0.3	0.1	0.1	0.1	0.3	0.5	0.7	0.5	0.5	4.6	4.6- 4.9 T	
I 11.1-12.0	0.8	0.2	0.0	0.0	0.0	0.2	0.4	0.4	0.1	0.1	0.1	0.4	0.8	0.8	0.4	0.6	5.5	5.0- 5.4 E	
L 12.1-13.0	0.6	0.1	0.0	0.0	0.0	0.1	0.3	0.2	0.0	0.0	0.1	0.3	0.6	0.5	0.2	0.4	3.6	5.5- 5.8 R	
E 13.1-14.0	0.8	0.2	0.0	0.0	0.0	0.1	0.2	0.2	0.0	0.0	0.1	0.4	0.7	0.5	0.2	0.5	4.0	5.9- 6.3 S	
S 14.1-15.0	0.7	0.1	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.1	0.3	0.7	0.3	0.1	0.4	3.2	6.4- 6.7 /	
/ 15.1-16.0	0.5	0.1	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.1	0.4	0.6	0.3	0.1	0.3	2.5	6.8- 7.2 S	
H 16.1-17.0	0.8	0.1	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.1	0.5	0.9	0.3	0.1	0.4	3.6	7.3- 7.6 E	
O 17.1-18.0	0.6	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.4	0.6	0.2	0.1	0.3	2.6	7.7- 8.0 C	
U 18.1-19.0	0.8	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.4	0.8	0.2	0.1	0.3	2.9	8.1- 8.5 O	
R 19.1-20.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.4	0.7	0.2	0.1	0.3	2.5	8.6- 8.9 N	
20.1-25.0	2.9	0.1	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.0	0.2	1.6	3.1	0.4	0.3	1.3	10.1	9.0-11.2 D	
25.1-30.0	1.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.8	2.1	0.2	0.1	0.8	6.0	11.3-13.4	
30.1-35.0	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	1.0	0.1	0.0	0.4	2.6	13.5-15.6	
35.1-40.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.4	0.0	0.0	0.1	0.9	15.7-17.9	
>40.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.3	>17.9	
CALM																	0.0	CALM	
TOTAL	16.2	3.1	1.1	0.9	1.2	3.0	5.4	5.3	3.0	2.8	3.6	9.4	17.3	9.4	7.7	10.5	100.0	TOTAL	
AV SPEED (MPH)	17.4	9.6	6.3	5.0	5.9	9.0	8.6	8.0	6.8	6.4	8.7	15.4	17.8	11.0	9.4	14.4	13.0	AV SPEED (MPH)	
AV SPEED (M/SEC)	7.8	4.3	2.8	2.2	2.6	4.0	3.8	3.6	3.0	2.9	3.9	6.9	8.0	4.9	4.2	6.4	5.8	AV SPEED (M/SEC)	

SOURCE: GEORESEARCH, INC.

Figure IV - 18
 Annual Wind Rose
 JUDITH GAP — WHEATLAND COUNTY
 (1981 - 1985)

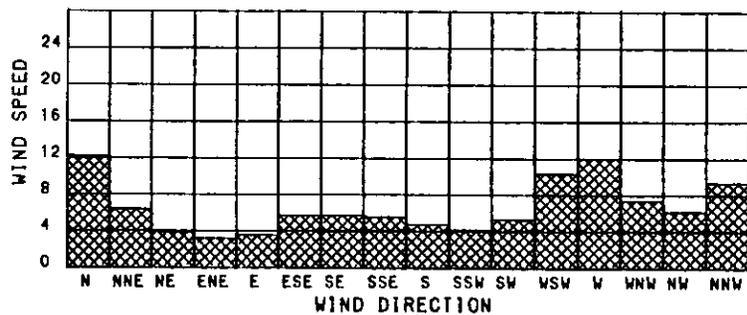
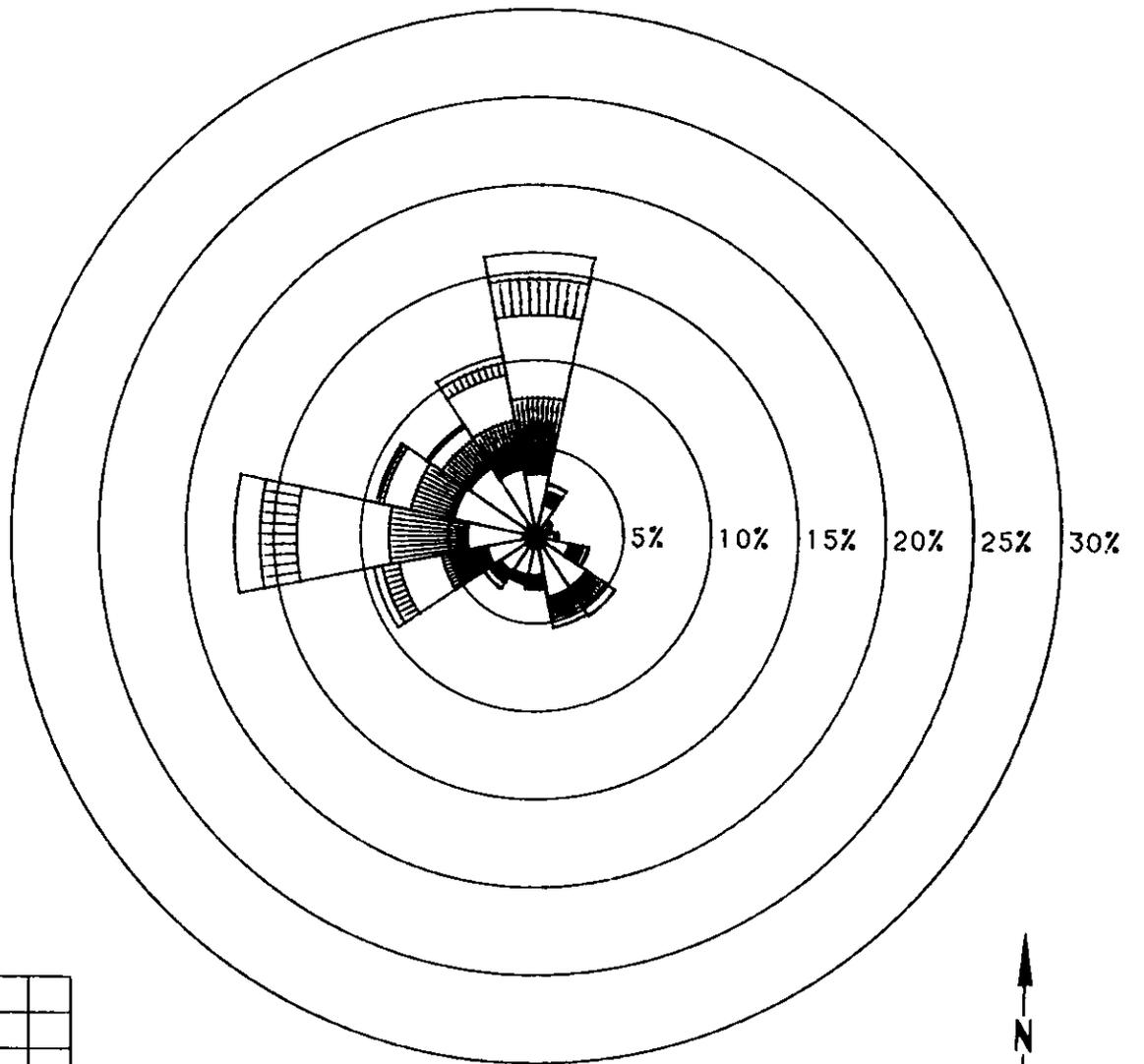
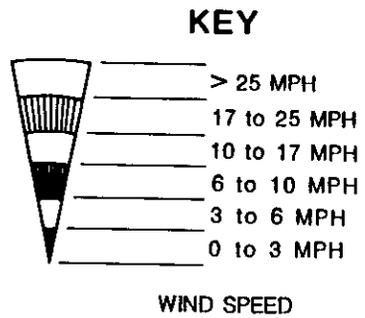


Table IV - 166
Coefficients of Weibull Distribution
WHEATLAND COUNTY - JUDITH GAP
08/06/81 - 07/31/85

MONTH	SCALE FACTOR (C) (M/SEC)	SHAPE FACTOR (K)
JANUARY	7.4533	1.4136
FEBRUARY	7.6730	1.6217
MARCH	6.8146	1.5179
APRIL	6.5247	1.5106
MAY	6.6626	1.6132
JUNE	5.7149	1.6357
JULY	5.4999	1.6946
AUGUST	4.8058	1.9015
SEPTEMBER	5.8041	1.7580
OCTOBER	6.0849	1.4971
NOVEMBER	6.3852	1.5566
DECEMBER	7.4103	1.4924
YEAR	6.3004	1.5767

SOURCE: GEORESEARCH, INC.